AD-A139 845 NOW --- AN INITIAL APPROACH TO COLLECTION OF MAJOR MATERIEL SYSTEMS ACTUAL COSTS(U) OFFICE OF THE COMPTROLLER OF THE ARMY WASHINGTON DC DIRECTORA.. 1/1

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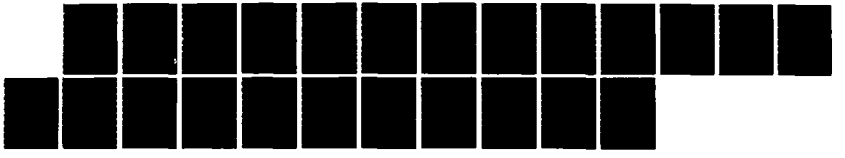

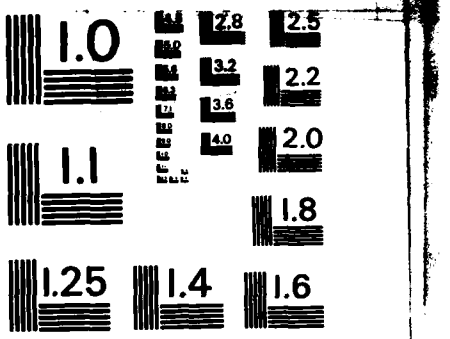

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE

(2)

R

1a. REPORT SECURITY CLASSIFICATION
UNCLASSIFIED

AD A139845

2a. SECURITY CLASSIFICATION AUTHORITY

ORT

2b. DECLASSIFICATION/DOWNGRADING SCHEDULE

Approved for public release; distribution unlimited.

4. PERFORMING ORGANIZATION REPORT NUMBER(S)
DCA-P-98

5. MONITORING ORGANIZATION REPORT NUMBER(S)

6a. NAME OF PERFORMING ORGANIZATION
Cost Analysis Division
USAFAC

6b. OFFICE SYMBOL (*If applicable*)
DACA-CAD

7a. NAME OF MONITORING ORGANIZATION

6c. ADDRESS (*City, State and ZIP Code*)
Fort Benjamin Harrison
Indianapolis, IN 46249

7b. ADDRESS (*City, State and ZIP Code*)

8a. NAME OF FUNDING/SPONSORING ORGANIZATION
Directorate of Cost Analysis

8b. OFFICE SYMBOL (*If applicable*)
DACA-CA

9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER

8c. ADDRESS (*City, State and ZIP Code*)
Room 2A690
The Pentagon
Washington, DC 20310

10. SOURCE OF FUNDING NOS.

PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.	WORK UNIT NO.

11. TITLE (*Include Security Classification*)
(See Reverse)

12. PERSONAL AUTHOR(S)
Mrs. Dina Philips, Mrs. Mary Carson

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (*Yr., Mo., Day*)	15. PAGE COUNT
	FROM _____ TO _____	83/10	

16. SUPPLEMENTARY NOTATION

17. COSATI CODES		
FIELD	GROUP	SUB. GR.

18. SUBJECT TERMS (*Continue on reverse if necessary and identify by block number*)
-Army Cost Analysis Report
-Cost Data
-Materiel Systems Actual Costs
-Weapon Systems Cost Data Collection
-Life Cycle Costs
-Total System Costing

19. ABSTRACT (*Continue on reverse if necessary and identify by block number*)
This paper presents an approach that in the foreseeable future could provide a significant percentage of major Army systems' life cycle actual (historical) costs.

Also presented are procedures that could be implemented now to collect/derive a significant portion of those costs.

This approach was tested on three Selected Acquisition Report (SAR) systems. The test procedures and results are included.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT
UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS ☐

21. ABSTRACT SECURITY CLASSIFICATION
UNCLASSIFIED

22a. NAME OF RESPONSIBLE INDIVIDUAL	22b. TELEPHONE NUMBER (*Include Area Code*)	22c. OFFICE SYMBOL
Mr. Noel B. Summers, Jr. Chief, Cost Analysis Division	(317) 542-2674	DACA-CAD

DD FORM 1473, 83 APR EDITION OF 1 JAN 73 IS OBSOLETE.

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE

11. Now - An Initial Approach to Collection of Major Materiel Systems Actual Costs (UNCLASSIFIED)

NOW ---
AN INITIAL APPROACH TO

COLLECTION OF MAJOR MATERIEL SYSTEMS

ACTUAL COSTS

OCTOBER 1983

DCA-P- 98

Accession For	
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Justification	
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Distribution/	
Availability Codes	
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COST ANALYSIS DIVISION

U. S. ARMY FINANCE AND ACCOUNTING CENTER

APPROVED: _____

W. M. ALLEN
DIRECTOR OF COST ANALYSIS
OFFICE OF THE COMPTROLLER OF THE ARMY

TABLE OF CONTENTS

NOW ---
AN INITIAL APPROACH TO COLLECTION OF MAJOR MATERIEL SYSTEMS ACTUAL COSTS

I. PURPOSE. The purpose of this paper is to present an approach that in the foreseeable future could provide a significant percentage of major Army systems' life cycle actual (historical) costs and to present procedures that could be implemented today to collect/derive a significant portion of those costs.

II. BACKGROUND. The Army has a need to link downstream "execution" (accounting data which come from the finance and accounting system) with upstream "deciding" (cost data which come from the cost estimating and analysis system), i.e., a feedback mechanism. The Army's finance and accounting system evolved along lines required to report financial information by appropriation (funds accounting). However, managers within the Army need information that is system-oriented and that, by necessity, cuts across appropriation lines. Efforts to date to obtain actual (historical) life cycle costs of major Army systems have not been successful, but attention recently has been directed toward the possibility that a significant portion of a major materiel system's life cycle costs could be captured from the Army's finance and accounting data as the result of several current studies and a review of the system acquisition management process within the Army.

III. RECENT DEVELOPMENTS.

a. On 10 June 1983, the Chief of Staff issued a Memorandum[1] which established a time-phased plan of action and staff responsibilities for improving the system acquisition management process within the Army in order to achieve integration of weapons systems costing, programming and execution management systems. Phase I requirements included establishment of data displays and system linkages.

b. The Directorate of Cost Analysis on 19 August 1983, published a paper[2] containing instructions for reformatting the Baseline Cost Estimate/ Independent Cost Estimate (BCE/ICE) to implement a requirement of the memorandum. A modified costing convention was developed in response to the need for appropriation discrete estimates which could provide direct input to the Planning, Programming, Budgeting and Execution System (PPBES). The new formats are oriented to five activities:

---

[1]Memorandum, DACS-DPZ-B, 10 June 1983, Integration of Weapons Systems Costing, Programming and Execution Management Systems

[2]Instructions for Reformatting the BCE/ICE, DCA-P-92, 19 August 1983

1. Development
2. Production
3. Military Construction
4. Fielding
5. Sustainment

The new formats also forge the linkage needed to provide cost feedback data from PPBES output.

c. Independent of these developments, two studies were conducted by the Cost Analysis Division, USAFAC, to determine the ability of the Army's finance and accounting data to yield major Army systems' costs with respect to the RDTE and Procurement appropriations. The first study[3] centered on the Procurement BLIN (Budget Line Item Number) which is used to control execution of procurement programs; the second study[4] paralleled the first but looked at Project Numbers used to control execution of RDTE (Research, Development, Test and Evaluation) programs.

1. The results of these two studies show that an approximation of a major system's total Procurement and RDTE costs could be obtained by using the current BLIN's and Project Numbers augmented by data available in other PPBES documents.

2. A test of this procedure was conducted using three Selected Acquisition Report (SAR) systems and their current Baseline Cost Estimates. The results are shown below:

SYSTEM	PERCENTAGE OF BCE FOR FY 83 IDENTIFIED/EXPLAINED		
	PROC	RDTE	RDTE & PROC
UH60 BLACKHAWK Aircraft	88.10%	94.40%	88.24%
PATRIOT Missile System	92.80%	99.15%	93.13%
M1 (ABRAMS) Tank	95.40%	93.20%	95.29%

Test procedures and graphs are attached at Appendix A.

IV. APPROACH. This approach involves use of the modified cost format which is oriented to five activities (see Matrix "B" at Appendix B).

a. Development. All costs associated with development are funded by the RDTE appropriation and no RDTE funds are allocated to other activities.

---

[3]Results of a Research Study to Identify Historical Procurement Obligations and Expenditures on Major Army Materiel and Non-Materiel Systems, DCA-P-95, May 1983. An Executive Summary is attached at Appendix C.

[4]Results of a Research Study to Identify Historical RDTE Obligations and Expenditures on Major Army Materiel and Non-Materiel Systems, DCA-P-97, October 1983. An Executive Summary is attached at Appendix D.

The test showed that an approximation of total RDTE costs of three major Army systems could be determined by identifying projects totally attributable to those systems.

b. Production. All costs associated with production are funded by one of the six Procurement appropriations; however, unlike RDTE/Development, some of the Procurement appropriation funds are associated with another activity. For example, replenishment spares are associated with the sustainment activity. Actually, these costs were not "trackable" in the test; therefore, when these costs are reported under sustainment, there should be a better approximation of procurement costs in the production activity.

c. Military Construction. In response to the need for cost feedback on a system basis for the SAR systems, the DCA, in coordination with the Office of the Corps of Engineers developed a methodology that military construction projects would be identifiable as system related on a case-by-case basis.

d. Fielding. The costs pertaining to the fielding of major Army systems are funded from the Operations Maintenance, Army appropriation. Procedures are being developed at the Army's Finance and Accounting Center to identify and report Fielding costs, a requirement of the CSA Memorandum.

e. Sustainment. This activity relates mainly to the operating and support costs of major Army systems which have been fielded. A significant portion of these costs should be available from O&SCMIS (Operating and Support Cost Management Information System) now under development. However, as currently designed, O&SCMIS may not pick up all costs, i.e. operating and support costs identified would not include the project management costs of the Research and Development phase as defined in the traditional costing convention. These costs were eliminated from the development activity, but O&SCMIS has not been redesigned to capture these "other than RDTE appropriation costs" under the modified costing convention.

V. SUMMARY. Managers within the Army need information that is system-oriented, but efforts to date to obtain actual (historical) life cycle costs of major Army materiel systems have not been successful. However, recent activities leading to the integration of systems' costing, programming and execution management systems have provided the impetus for a new approach that in the foreseeable future could yield a significant percentage of major Army systems' life cycle costs. Further, it has been determined that a significant portion of those costs could be available today. That is, it is not necessary to wait until all procedures are "in place" to begin collecting and reporting data. Efforts could begin now to obtain cost feedback from the first two activities in the life cycle of a major Army system, development and production. This would represent a significant step toward the realization of total system costing.

APPENDIX A

TEST PROCEDURES AND RESULTS

1. The concept of this approach is that by using system-unique BLIN's and RDTE Project Numbers in conjunction with other PPBES data, a high percentage of major systems' Procurement/RDTE actual costs/obligations could be tracked/derived. Annually, five steps would have to be accomplished. The first step would be to identify all current fiscal year BLIN's and RDTE Project Numbers totally attributable to each major system. Next, the approved program amounts associated with the identified BLIN's/RDTE Project Numbers would be obtained and summed for each system. The total approved program amount for each set of system BLIN's/RDTE Project Numbers would then be compared with the current fiscal year Procurement/RDTE estimates in the latest Baseline Cost Estimate (BCE) for each system. The next step would be the identification/explanation of any difference between the systems' approved program and the BCE's by using data in the Procurement Annex to the Five Year Defense Program, the Five Year Defense Program RDTE Project Listing, and other data sources. The last step is the actual tracking/derivation of the system's Procurement/RDTE actual costs/obligations.

2. A test of the above approach was conducted using three SAR (Selected Acquisition Report) systems - the UH60 (BLACKHAWK) aircraft, the PATRIOT missile system, and the M1 (ABRAMS) tank. The criteria used in selecting these systems were that they had a significant FY 83 Procurement/RDTE program, a recent BCE available, and represented three different materiel system classes. The BCE data used in this test were obtained from the following:

BASELINE COST ESTIMATES

BLACKHAWK	Total R&D and Investment Funding Profile, BCE, March 1983
PATRIOT	Program Manager's BCE, January 1982
ABRAMS	Program Manager's BCE, April 1982

3. The FY 83 current dollars expressed in the BCE's for PATRIOT and M1 ABRAMS tank had been calculated with inflation indices promulgated by OSD and published in 1982. The FY 83 current dollars in the BLACKHAWK BCE had been calculated with updated indices published in early 1983. To provide consistency among systems, the BLACKHAWK data were deflated to constant dollars and then re-inflated with the index for FY 83, as published in 1982. The decision to change the BLACKHAWK data rather than the PATRIOT and M1 data

was made in order to avoid bias. That is, the difference would have been smaller because the index published in 1983 showed a lower rate of inflation.

4. The next step in the test was to determine how much of each system's FY 83 Procurement/RDTE estimate in the BCE could be identified/explained from the BLIN's/RDTE Project Numbers and other PPBES data. The results are shown graphically on the next six pages (Figure A-1 through A-6).

5. This approach could be implemented unilaterally because all the data sources needed are available, and it would not impact on any of the current procedures in the PPBES. The approach could satisfy to a great extent the need for Procurement/RDTE cost data.

RDTE
FY 83 BLACKHAWK PROGRAM

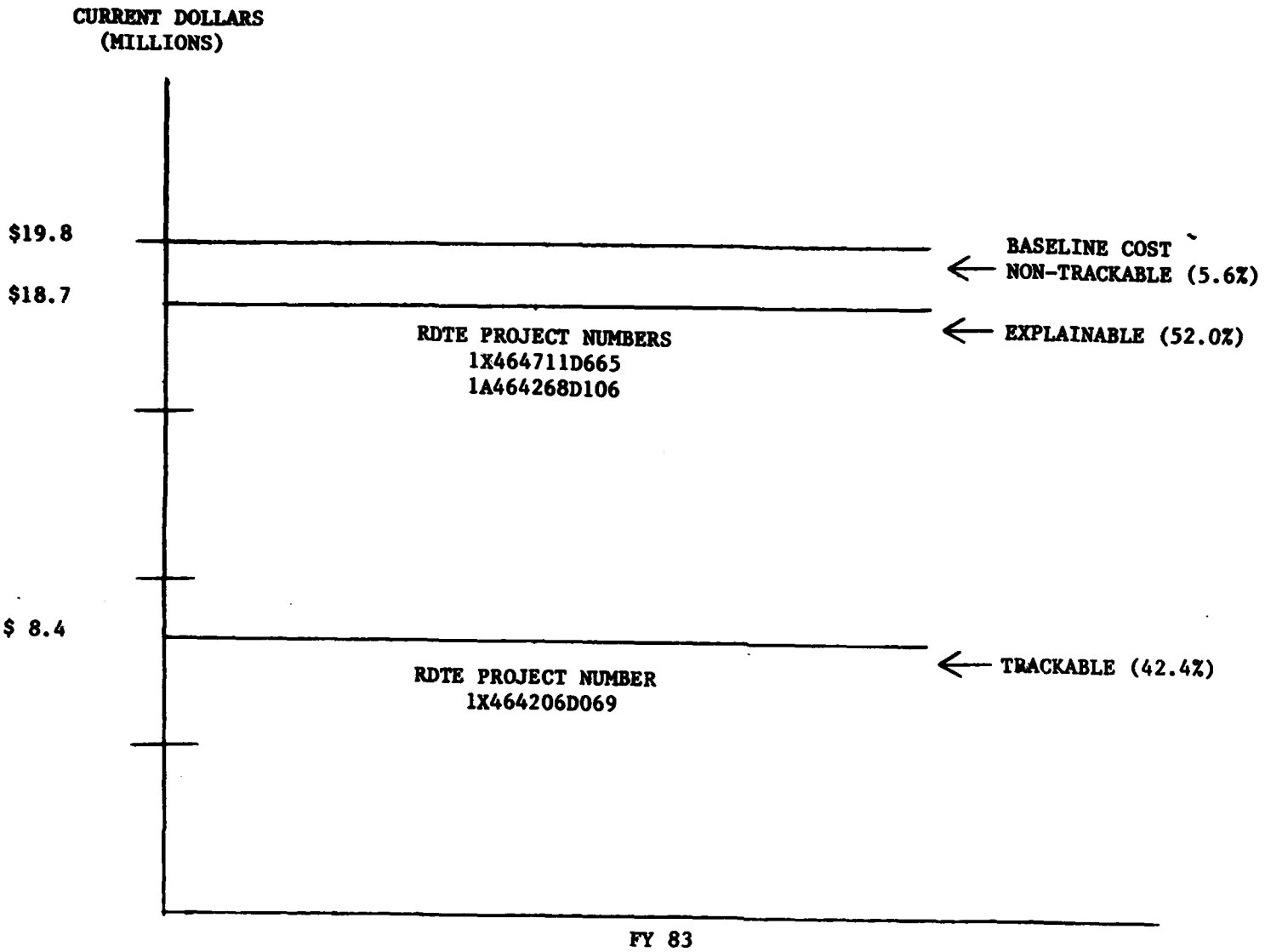


Figure A-1

PROCUREMENT
FY 83 BLACKHAWK PROGRAM

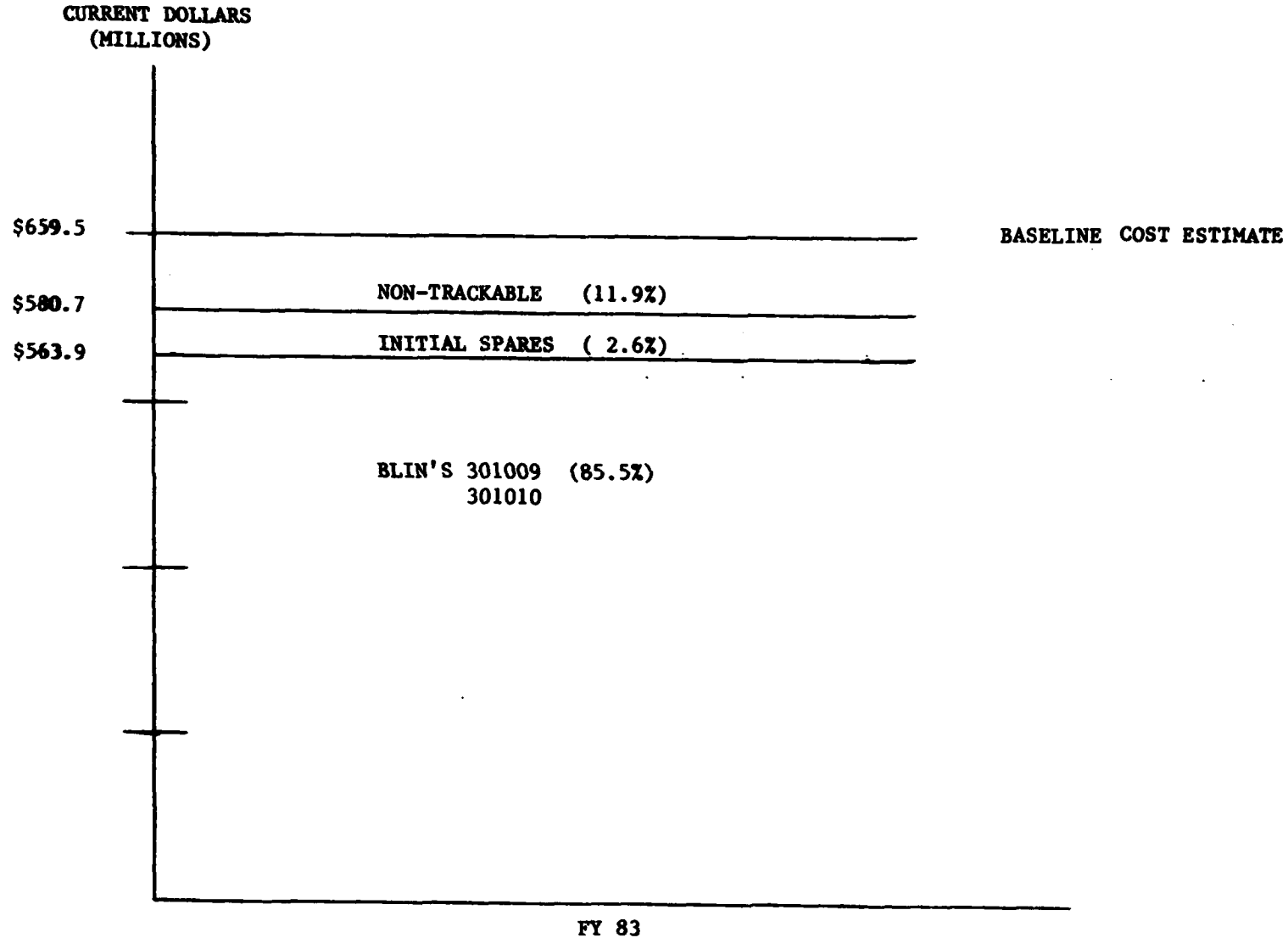


Figure A-2

RDTE
FY 83 PATRIOT PROGRAM

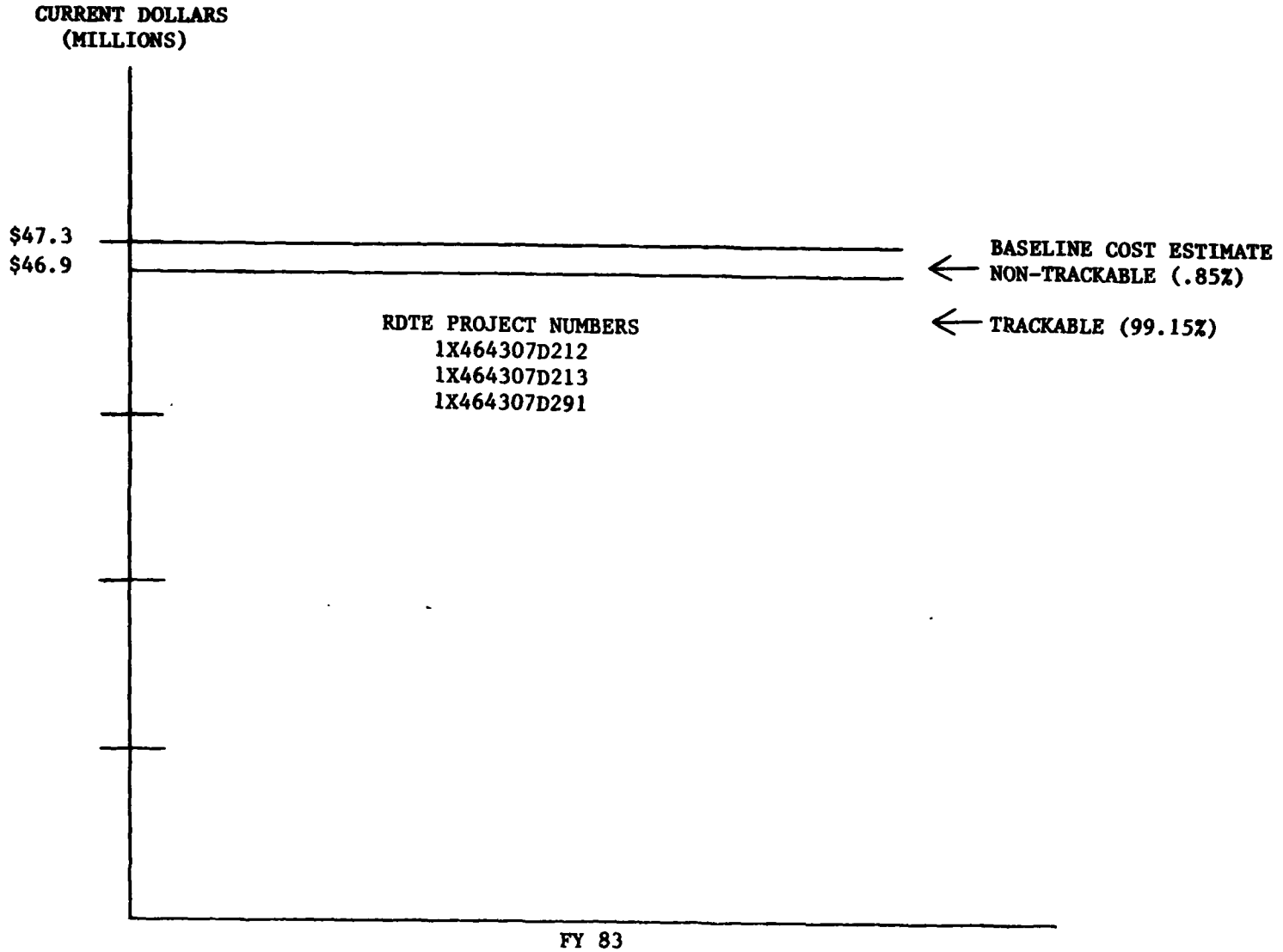
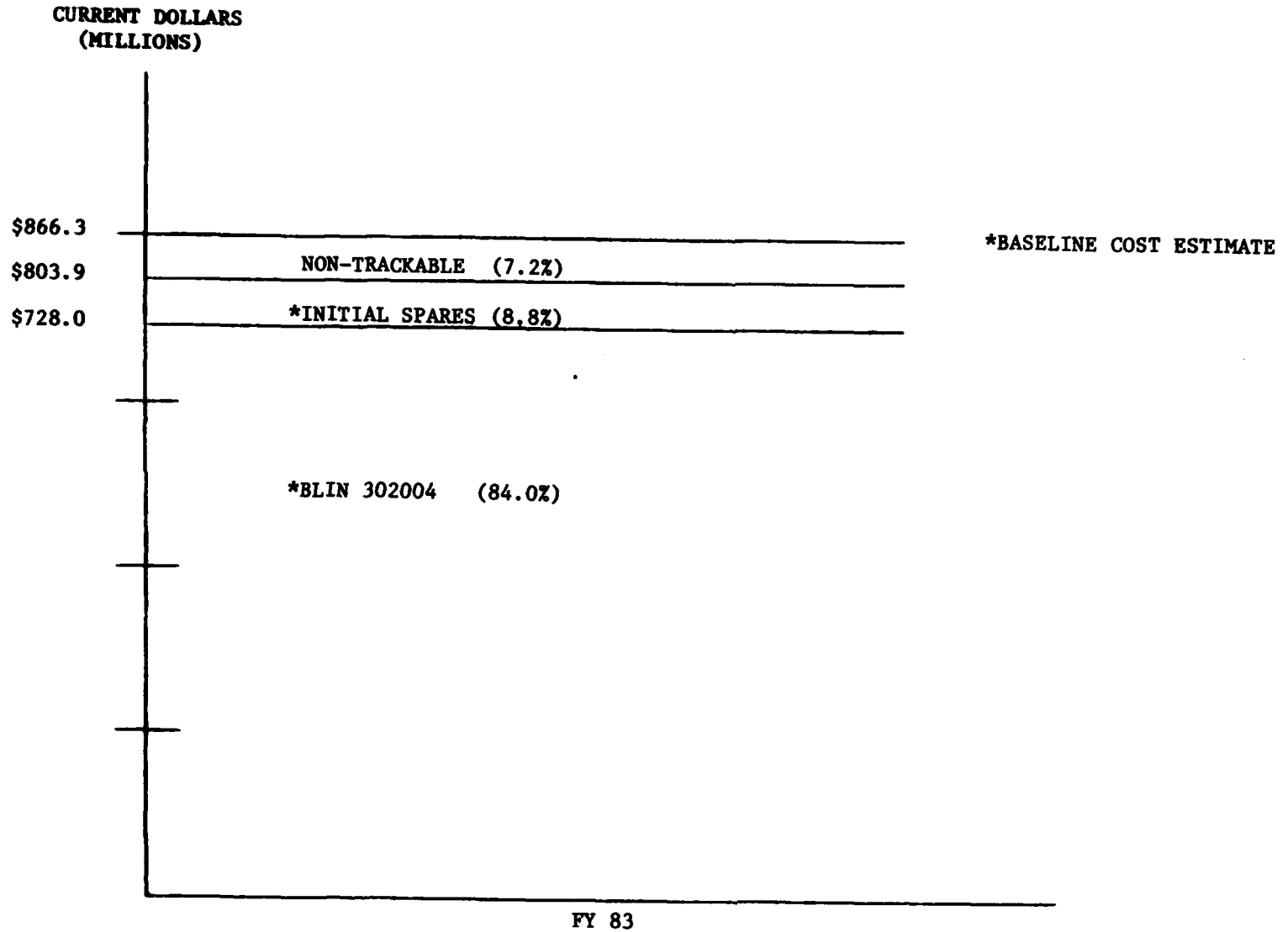


Figure A-3

PROCUREMENT
FY 83 PATRIOT PROGRAM



*The Jan 83 reduction in the quantity of fire units is not reflected in this data.

Figure A-4

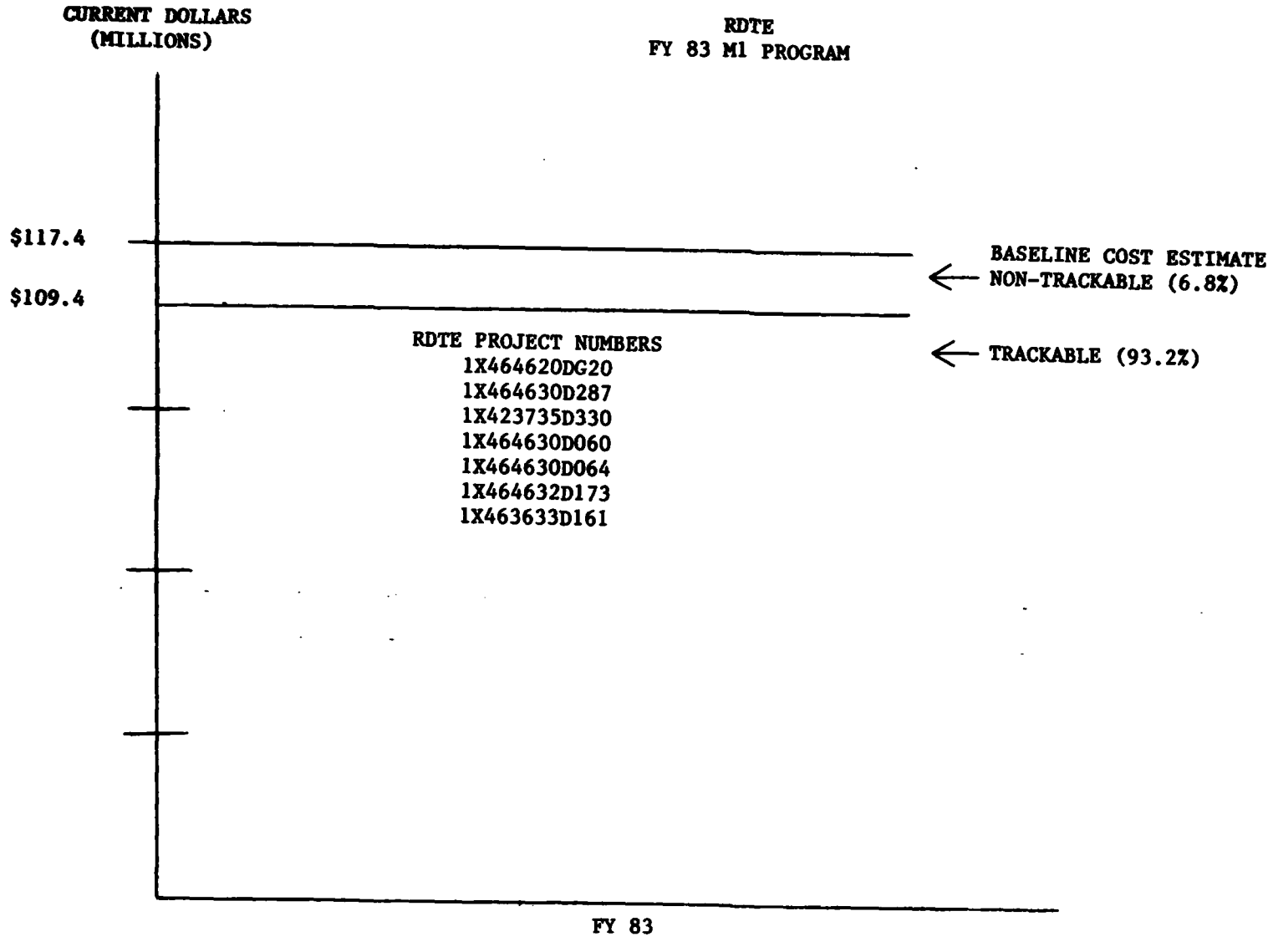

CURRENT DOLLARS
(MILLIONS)
RDTE
FY 83 M1 PROGRAM
$117.4
$109.4
BASELINE COST ESTIMATE
NON-TRACKABLE (6.8%)
TRACKABLE (93.2%)
RDTE PROJECT NUMBERS
1X464620DG20
1X464630D287
1X423735D330
1X464630D060
1X464630D064
1X464632D173
1X463633D161
FY 83

Figure A-5

PROCUREMENT
FY 83 M-1 ABRAMS TANK PROGRAM

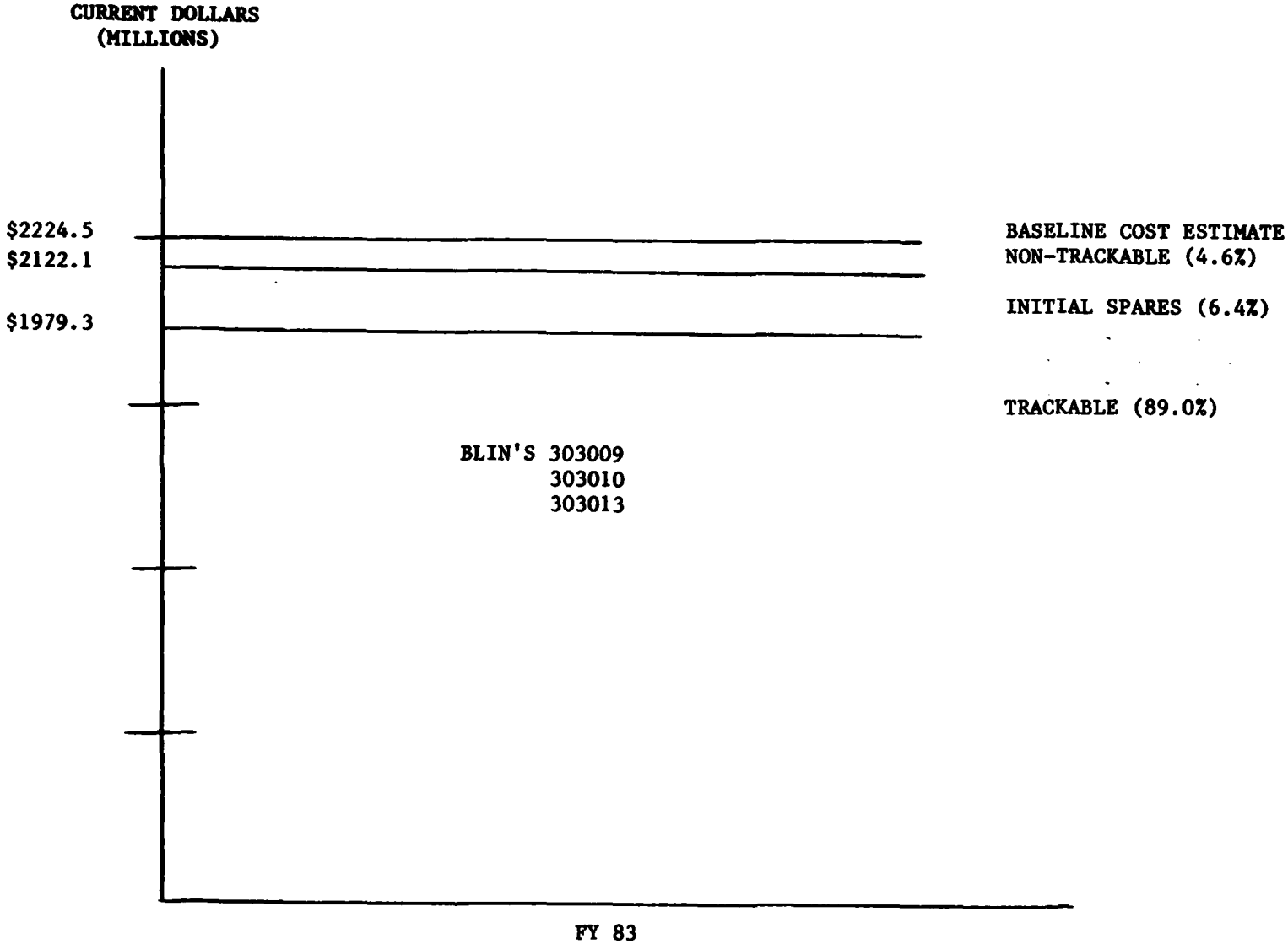


Figure A-6

B MATRIX

ROW	FUND APP	DEFN REF	SYSTEM STRUC (J) / COST ELEMENT (I)	FRAME 1.0	PROP 2.0	GUID CT/CM 3.0	FIRE CONT 4.0	ARMOR 5.0	PAYLD /AMMO 6.0	TO BE SPEC 7.0	ASIOE PEC SPT EQ 8.0	ASIOE CMN SPT EQ 9.0	OTHER 10.0	TOTAL 11.0	PER CENT 12.0
1	RD	1.0	DEVELOPMENT												
2	RD	1.01	DEVELOPMENT ENG												
3	RD	1.011	ENGINEERING												
4	RD	1.012	PROD,ENG,& PLAN (PEP)												
5	RD	1.013	TOOLING												
6	RD	1.014	PROTOTYPE MANUFACTURE												
7	RD	1.02	DATA												
8	RD	1.021	INT LOG SUP (ILS)												
9	RD	1.022	NON-ILS												
10	RD	1.03	SYSTEM TEST & EVAL												
11	RD	1.031	ILS												
12	RD	1.032	NON-ILS												
13	RD	1.04	SYS/PROJ MGMT												
14	RD	1.05	ILS TRAIN,SERV & EQ												
15	RD	1.06	FACILITIES												
16	RD	1.07	OTHER RDT&E FUND DEV												
17	PR	2.0	PRODUCTION												
18	PR	2.01	NON-RECURRING PROD												
19	PR	2.011	PROV IND FACIL (PIF)												
20	PR	2.012	PROD BASE SUPT (PBS)												
21	PR	2.013	DEP MT PROD EQ (DMPE)												
22	PR	2.014	OTH NON-RECUR PROD												
23	PR	2.02	RECURRING PRODUCTION												
24	PR	2.021	MANUFACTURING												
25	PR	2.022	RECURRING ENG												
26	PR	2.023	SUSTAINING TOOLING												
27	PR	2.024	QUALITY CONTROL												
28	PR	2.03	ENGINEERING CHANGES												
29	PR	2.04	DATA												
30	PR	2.041	ILS												
31	PR	2.042	NON-ILS												
32	PR	2.05	SYSTEM TEST & EVAL												
33	PR	2.051	ILS												
34	PR	2.052	NON-ILS												
35	PR	2.06	ILS TRAIN,SERV & EQ												
36	PR	2.07	INITIAL SPARES												
37	PR	2.08	OPERAT/SITE ACTIV												
38	PR	2.09	OTH PROC FUND PROD												
39	MC	3.0	MILITARY CONSTRUCTION												
40	MC	3.01	TEST CONSTRUCTION												
41	MC	3.02	PROD CONSTRUCTION												
42	MC	3.03	OPER/SITE ACT CONSTR												
43	MC	3.04	OTH MCA FUND CONSTR												
44	OM	4.0	FIELDING												
45	OM	4.01	SYSTEM TEST & EVAL												
46	OM	4.02	ILS TRAIN,SERV & EQ												
47	OM	4.03	TRANSPORTATION												
48	OM	4.04	INITIAL REPAIR PARTS												
49	OM	4.05	SYS SPEC BASE OPS												
50	OM	4.06	OTH O&M FUND FIELD												
51	---	5.0	SUSTAINMENT												
52	---	5.01	REPLENISHMENT SPARES												
53	OM	5.011	O&M REPAIR PARTS												
54	PR	5.012	PROCUREMENT SPARES												
55	OM	5.02	PETR,OIL,& LUB (POL)												
56	PR	5.03	TRAINING AMMO/MISL												
57	OM	5.04	DEPOT MAINTENANCE												
58	OM	5.041	CIVILIAN LABOR												
59	OM	5.042	MATERIEL												
60	OM	5.05	FIELD MAINT CIV LAB												
61	OM	5.06	TRANSPORTATION												
62	---	5.07	SYS SPEC REPL TRAINING												
63	PR	5.071	AMMO/MSLE/EQUIP												
64	OM	5.072	SERVICES												
65	MP	5.08	MILITARY PERSONNEL												
66	MP	5.081	CREW PAY & ALLOWANCES												
67	MP	5.082	MAINT PAY & ALLOW												
68	MP	5.083	SYS SPEC SUPT P&A												
69	MP	5.084	TRAINEE/TRAINER P&A												
70	MP	5.085	SYS/PROJ MGMT P&A												
71	MP	5.086	PERM CHG OF STA (PCS)												
72	MP	5.087	OTH MPA FUND SUST												
73	OM	5.09	SYS/PROJ MGMT (CIV)												
74	PR	5.10	MODIFICATIONS/KITS												
75	---	5.11	OTHER SUSTAINMENT												
76	OM	5.111	OTH O&M FUND SUST												
77	PR	5.112	OTH PROC FUND SUST												
78	---	----	TOTAL LIFE CYCLE COST												

APPENDIX C

This is the Executive Summary from a paper prepared in Cost Analysis Division, USAFAC, titled "Results of a Research Study to Identify Historical Procurement Obligations and Expenditures on Major Army Materiel and Non-Materiel Systems," DCA-P-95, May 1983. For more information concerning this report, inquiries may be sent to the following address:

HQDA
ATTN: DACA-CA
The Pentagon
Washington, DC 20310

EXECUTIVE SUMMARY

RESULTS OF A RESEARCH STUDY TO IDENTIFY HISTORICAL PROCUREMENT OBLIGATIONS AND EXPENDITURES ON MAJOR ARMY MATERIEL AND NON-MATERIEL SYSTEMS

PURPOSE OF STUDY. This study was conducted as part of a continuing effort to obtain actual (historical) life cycle costs of major Army systems from the Army's finance and accounting data. An hypothesis was formulated and tested concerning the ability of Budget Line Item Numbers (BLIN's) to be used in identifying total procurement costs of major Army systems, with a view to determining the feasibility of restructuring/redefining BLIN's to assist in collecting/tracking those costs.

ACTIONS. Efforts included research of rules and practice on assignment and structure of BLIN's, development of correlation tables relating BLIN's to the total Army, and formulation of three alternative approaches to obtaining materiel and non-materiel system procurement costs.

FINDINGS. BLIN's do not identify total procurement costs by major Army systems, although they do identify a significant portion of a system's cost. A system can be represented by multiple BLIN's within an appropriation; one or more of a system's BLIN's may be found in other appropriations; and, one BLIN may represent portions of many systems' costs.

a. The primary cause of system funds fragmentation is the Budget Activity/Subactivity Structure which effectively separates a system from its modifications, spares and repair parts, and support equipment and facilities. Since the location of Budget Line Items in Exhibit P-1 (Supporting Data for the President's Budget) is determined by Budget Structure, and since the BLIN Serial Number is taken from that document, the BLIN's reflect the same funds fragmentations of systems.

b. As a consequence of fragmentation, it became necessary to locate a set of "rules" which could be used to define a "system." The set located and utilized yielded a list of systems that was both totally exhaustive and mutually exclusive in capturing the total Army.

c. BLIN's can be "tracked" for only five years. At the end of the fifth year, any funds not disbursed are placed in "M" accounts by appropriation. After the balances are merged, funds may be disbursed to satisfy Government liabilities; however, transactions cannot be associated with a BLIN. Thus, life cycle procurement costs of a system are not available even though the system is well-defined.

RESTRUCTURE. Three alternative BLIN architectures were developed to examine ways to improve historical data collection. The first approach does not involve restructure; rather, it uses the current BLIN, augmented by data in other PPBES documents, to obtain an approximation of major materiel systems' total procurement costs. The second approach addresses a change in Budget

Structure; and the third, which initially was to be a natural extension of Approach #2, proved to be just another "stovepipe" when what really is needed is a common architecture and language. Therefore, Approach #3 became the continuing effort to insure that the Army Management Structure (Redesign) (AMS(R)) maintains the matrix concept, the components remain managerially relevant, and the System Component is totally exhaustive while its subcomponents are mutually exclusive.

CONCLUSIONS. BLIN's perform the function of controlling procurement funds. It is questionable, however, as to whether they tell how well program and budget execution applies resources to achieve intended purposes. If BLIN's are expected to provide total procurement costs visibility by major systems, they currently fail this function.

APPENDIX D

This is the Executive Summary from a paper prepared in Cost Analysis Division, USAFAC, titled "Results of a Research Study to Identify Historical RDTE Obligations and Expenditures on Major Army Materiel and Non-Materiel Systems," DCA-P-97, October 1983. For more information concerning this report, inquiries may be sent to the following address:

HQDA
ATTN: DACA-CA
The Pentagon
Washington, DC 20310

EXECUTIVE SUMMARY

RESULTS OF A RESEARCH STUDY TO IDENTIFY HISTORICAL RDTE OBLIGATIONS AND EXPENDITURES ON MAJOR ARMY MATERIEL AND NON-MATERIEL SYSTEMS

OBJECTIVES. This study was conducted as part of a continuing effort to obtain actual (historical) life cycle costs of major Army systems from the Army's finance and accounting data. The objectives were:

a. Develop insights and information on the assignment and structure of RDTE Project Numbers and their interface with related resource management systems. Produce appropriate flow diagrams.

b. Develop correlation tables to relate RDTE Project Numbers to the total Army, with emphasis on Selected Acquisition Report (SAR) systems.

c. Collect and compare RDTE costs of selected systems with their Baseline Cost Estimates.

ACTIONS. An hypothesis was formulated and tested concerning the ability of RDTE Project Numbers to identify total RDTE costs of major Army systems. Efforts also included research of rules and practice on assignment and structure of RDTE Project numbers, development of correlation tables relating the project numbers to the total Army, and formulation of three alternative approaches to obtaining system RDTE costs.

FINDINGS.

a. RDTE Project Numbers are converted to RDTE AMS Code which can be used to obtain RDTE costs. Both numbering systems are project oriented; the projects of a system must be identified and their costs summed to obtain system RDTE costs. It was determined that a significant portion, but not all of a system's RDTE costs can be identified if the system's projects can be identified.

b. RDTE project costs can be "tracked" for only four years in the finance and accounting system. At the end of the fourth year, any funds not disbursed are placed in an RDTE "M" account. After the balances are merged, funds may be disbursed to satisfy Government liabilities; however, transactions cannot be associated with specific projects/systems. Thus, total RDTE costs of a system are not available even if the system is well-defined.

c. As a consequence of system fragmentation, it was found that a set of "rules" was needed for defining systems. The criteria for selection of such a set of "rules" necessarily were that the list of systems produced be both totally exhaustive and mutually exclusive in capturing the total Army.

RESTRUCTURE. Three alternative architectures were developed to examine ways to improve historical data collection. The first approach does not involve restructure; rather, it uses the current project numbers, augmented by other PPBES data to obtain an approximation of total system RDTE costs. The second

approach addresses a change in Budget Structure; and the third involves changes in the numbering systems also.

CONCLUSIONS. In order to satisfy the need for cost feedback by major Army system, the following are required:

a. A unified "Systems Language". Consensus is required on what constitutes a system - as opposed to a non-system - and what is included with respect to modifications, armament, ammunition, support equipment, etc.

b. A "Common Architecture". Numbering systems vary among appropriations (BLIN's for Procurement, AMS Code for RDTE, etc.). System life cycle costs cut across appropriation lines. A common architecture should be prerequisite to development of "system" identification coding schemes.